Patent
Attorney's Docket No. 000600-033

REMARKS

Claims 1-7, 12-14 and 17-19 have been rejected under 35 U.S.C. § 112 as not specifying the kinds of monomers in the polymer shell. This objection is overcome by the amendments in the independent claims 1, 2, 17 and 18.

Claims 18 and 19 have been rejected under 35 U.S.C. § 112 as failing to comply with the enablement requirement. However, page 7, line 22 to page 8, line 17 of the specification states that the reaction products (i.e., "compounds") can be obtained by treating microspheres comprising residual monomers with an agent as specified in claim 1. Thus, it is evident that the specification enables one skilled in the art to obtain microspheres comprising compounds as defined in claim 18 and 19.

Claims 1-2, 4-9 and 12-18 have been rejected under 35 U.S.C. § 112 for failing to particularly point out and distinctly claim the subject matter of the invention. Applicants respectfully disagree.

First, the Examiner has objected to the term "derivative". However, it is standard practice in chemistry to use the term "derivative" to describe compounds that are formed from, or can be regarded as formed from, a structurally related compound. One skilled in the art of chemistry would have no difficulty judging whether or not a compound is a derivative, particularly as recited in independent claims 1 and 2 that the agent comprises at least one sulfur atom having at least one free electron pair and binding three oxygen atoms, and in independent claim 18 that the compound should fall within any of Formula I or II.

Second, the Examiner has objected to the term "reaction product" in claims 18 and 19, alleging that it is unclear what it is a reaction product of. This objection is overcome by the amendment of claim 18 replacing "reaction product" for "compound".

Finally, the Examiner alleges that the compounds specifically listed in claim 19 are inconsistent with those of Formulas I and II in claim 18. This objection is not understood and the Examiner is requested to give concrete examples of what could be regarded as inconsistent.

Claims 1-17 and 20 have been rejected under 35 U.S.C. § 103 as obvious over US 4287308 (Nakayama et al) in combination with US 4255307 (Miller). However, this rejection is not well founded.

The present invention relates to a process for the production of expandable thermoplastic microspheres, a process for eliminating or reducing residual monomers from thermoplastic expandable microspheres, and microspheres obtainable by the process. More specifically, the invention deals with the problem of providing an efficient method of eliminating or reducing residual monomers without unacceptable discoloration of the microspheres or significantly adversely affecting their capability of expansion. It has been found possible to solve this problem by contacting the microspheres with an agent selected from oxo-acids of sulfur, salts or derivatives thereof, comprising at least one sulfur atom having at least one free electron pair and binding three oxygen atoms.

Nakayama et al discloses use of certain cyanoethylation agents for eliminating acrylonitrile monomers from expandable microspheres. However, as acknowledged by the Examiner, Nakayama et al does not disclose use of such sulfur containing agents as claimed. Miller discloses reducing residual acrylonitrile in water dispersions of acrylonitrile polymers with alkali or ammonium sulfite. There is no indication that expandable microspheres can be treated, and particularly not that they can be treated without discolouration thereof or without adversely affecting their capability of expansion.

The Examiner has alleged that it would be obvious to use agents disclosed by Miller in a process as disclosed by Nakayama et al as functional equivalents. Applicants respectfully disagree.

Although Nakayama et al discloses several agents for eliminating acrylonitrile monomers from expandable microspheres, there is no teaching regarding other effects by using such agents,

such as discoloration or reduction of the expansion capabilities of the microspheres. According to the present invention it has been found that all agents for reducing or eliminating acrylonitrile monomers are in fact not functionally equivalent in treatment of expandable microspheres. This is shown in Example 1 of the present application where sodium sulfide, one of the most preferred agents disclosed in Nakayama et al, gives severe discoloration of the microspheres, while other agent such as benzene sulfonic amide or diphenyl sulfoxide affect the expansion capacity of the microspheres.

On the other hand, the agents according to the present invention give both effective removal of residual monomers and no or insignificant discoloration, which is a clearly unexpected effect that cannot be foreseen from the teachings of either Nakayama et al or Miller, taken alone nor in combination. As Miller neither deals with expandable microspheres nor gives the slightest hint that expandable microspheres can be treated without significant discoloration or adversely affecting the expansion capabilities, there would be no incentive whatsoever for a person of ordinary skill in the art to select any agent disclosed in Miller for use in the process of Nakayama et al. Therefore, claims 1-17 and 20 are clearly non-obvious over the prior art and in particular over Nakayama et al in combination with Miller.

Finally, claim 20 has been rejected under 35 U.S.C. § 102, alternatively 35 U.S.C. § 103, over Nakayama et al. The Examiner has alleged that Nakayama et al discloses several microspheres containing residual nitrile monomers of the level below the claimed level. However, Nakayama et al does not disclose the brightness of the microspheres and as shown in Example 1 of the present application the claimed brightness is not obtained by treatment with, e.g., sodium sulfide, one of the most preferred agents of Nakayama et al. Therefore, claim 20 is neither anticipated by nor obvious in view of Nakayama et al.

In view of the above, applicants respectfully request that a timely Notice of Allowance be issued in this case.

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Date: December 27, 2005

Respectfully submitted,

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